

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/SE05/000348

International filing date: 10 March 2005 (10.03.2005)

Document type: Certified copy of priority document

Document details: Country/Office: SE
Number: 0401250-6
Filing date: 14 May 2004 (14.05.2004)

Date of receipt at the International Bureau: 04 April 2005 (04.04.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

PRV

PATENT- OCH REGISTRERINGSVERKET

Patentavdelningen

PCT / SE 2005 / 0 0 0 3 4 8

Intyg Certificate

Härmed intygas att bifogade kopior överensstämmer med de handlingar som ursprungligen ingivits till Patent- och registreringsverket i nedannämnda ansökan.

This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.

(71) Sökande Telefonaktiebolaget L M Ericsson (publ), Stockholm
Applicant (s) SE

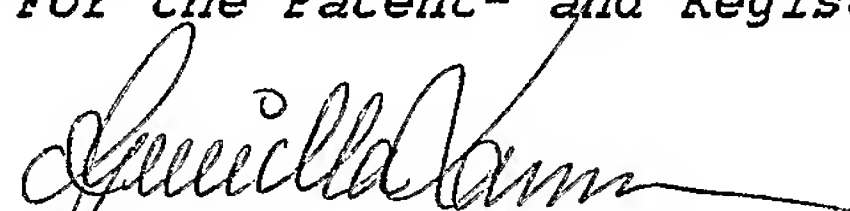
(21) Patentansökningsnummer 0401250-6
Patent application number

(86) Ingivningsdatum 2004-05-14
Date of filing

(30) Prioritet begärd från 2004-03-12 SE 0400622-7

Stockholm, 2005-03-15

För Patent- och registreringsverket
For the Patent- and Registration Office


Gunilla Larsson

Avgift
Fee

A METHOD AND ARRANGEMENT FOR PROVIDING USER INFORMATION TO A
TELECOMMUNICATION CLIENT.

TECHNICAL FIELD

5 The present invention relates generally to a
method and arrangement for providing requested information
to a telecommunication client regarding a plurality of
users. In particular, the invention is concerned with making
the communication more efficient in the process of
10 delivering such information to the client.

BACKGROUND OF THE INVENTION AND PRIOR ART

Fixed and mobile communication terminals have so
far been used mainly for making voice calls. The service of
15 communicating limited text messages, such as SMS (Short
Message Service) messages, is also used extensively by
mobile terminals. These are fairly straightforward
telecommunication services which use well-established
technologies for chiefly circuit-switched single
20 connections. In the standardized communication protocols
used for calls between fixed and/or mobile terminals,
predefined sets of communication rules and parameters are
typically used.

A multitude of new telephony services are now
25 rapidly being developed, which can be employed in particular
by the introduction of new communication technologies which
provide greater network capacity and higher transmission
rates. For example, GPRS (General Packet Radio Service) and
WCDMA (Wideband Code Division Multiple Access) technologies
30 are currently emerging for enabling wireless telephony
services requiring a wide range of data rates and different
protocols. The trend today is a move towards packet-switched

networks and technologies providing more capacity and flexibility. Further, new sophisticated terminals for communication are also emerging on the market, adapted to handle the new services.

5 Many of the new services involve real-time transmission of video information as well as audio information, and may further include the transmission of added data representing text, documents, images, audio files and video files in a multitude of different formats and combinations. Such services are generally referred to as "multimedia" services, which term will be used in this description to represent any telephony services that involve the transfer of information in addition to ordinary voice. Another trend is to converge all services on to a single transport mechanism - the Internet Protocol (IP), regardless of the type of access networks and technologies.

15 Recently, a network architecture called "IP Multimedia Subsystem" (IMS) has been developed by the 3rd Generation Partnership Project (3GPP) as an open standard, to give operators of access networks the ability to offer multimedia services in the packet domain. An IMS network, comprising various different network elements to handle the services, can be built above any type of access network and is independent of the access technology used, provided that the access network is able to support the service requirements in terms of bandwidth, QoS (Quality of Service), etc. Hence, IMS is a platform for enabling services based on IP transport, not restricted to any limited specific set of services.

25
30 Two important examples of services that can be employed by means of the IMS solution are Instant Messaging (IM) and Presence services. In the IMS solution, presence

services are supported by the "Session Initiation Protocol" (SIP) which has been defined by IETF as a generic session management protocol to support a wide range of IP-based services. SIP is purely a signalling protocol for creating, 5 modifying and terminating communication sessions with one or more participants.

Instant Messaging involves the transmission of relatively short messages, e.g. including text, pictures, logos audio/video clips, etc., in "near real-time" between 10 terminals, i.e. with small delays. In this context, "presence" is basically a dynamic and variable state profile of a user, and the presence services basically involve making the presence of a user visible to other users, which furthermore can be used to control other services in turn. 15 This user profile comprises so-called "presence data" basically defining the state of the user and his/her equipment in any predefined respect. Thus, the term "presence" is here given a very broad meaning, and the following "user states" may for example make up the presence 20 data:

- A personal status, such as: available, busy, in a meeting, on holiday, etc.
- A terminal status, such as: switched on/off, engaged, out of coverage, etc.
- 25 - The geographic location of the user/terminal.
- Terminal capabilities, such as: functionality for SMS, MMS, chat, IM, video, etc.
- Terminal selections, such as: call forwarding, language, etc.
- 30 - Other information, such as: interests, occupations, personal characteristics, moods, personal logos, logo depending on the current mood, etc.

All this information, or any selected parts thereof, is stored in the IMS network, based on so-called "publications of events" received from the network or a user whenever the user changes any of his/her presence data.

5 According to some services, it is possible for a user to subscribe for selected presence data of one or more other users, e.g. according to a list of users which may be either predefined, such as a phone book, or ad hoc, i.e. temporarily defined. A user subscribing for presence data
10 will hereafter be called a "client". Presence subscriptions are typically provided and handled by a functionality in the IMS of the client's access network.

A client may thus subscribe for presence data according to a list of users during a limited period of
15 time, e.g. 12 hours. In one current implementation, the subscription period may be further extended upon request at any time before expiry. This service may be provided such that during the subscription time period, the client will receive a notification from its IMS network as soon as one
20 of the users in the list has changed his/her presence data, such as having moved to another location. This is often referred to as a "push" behaviour. Alternatively, the client may subscribe for presence data by requesting presence data just once, thus allowing the client to fetch information
25 when needed by request, i.e. a "pull" behaviour. Thus, each time the client requests for presence data, a "one-off subscription" is established, meaning that the subscription is valid for only one such delivery. The mechanisms for these services has been defined by IETF (Internet
30 Engineering Task Force).

A basic procedure according to the prior art for providing presence data of a group of users to a client,

will now be described with reference to Fig. 1, which illustrates schematically a typical communication scenario. In this example, a client 100 is wirelessly connected to a mobile access network 102, hereafter called "client access network", and a number of other users 104 are likewise connected to various other mobile access networks 106a-c. It is assumed that each of the involved networks 104, 106a-c is capable of providing the above-described presence service, e.g. by means of having the IMS solution implemented for each network. This means that each network has the necessary network elements, not further described here, to receive and handle presence data updates by the publication of events from connected users whenever their presence data is changed.

Moreover, the client access network 102 is also adapted to collect updated presence data of the users 104 from the other networks 106a-c, and to provide presence information on the users to the client 100, either by a push behaviour or a pull behaviour as described above. In the IMS solution, a network element called "Resource List Server (RLS)" is used for providing such presence information to the client. Of course, the other networks 106a-c are also capable of providing presence information in the same manner to their respective clients, i.e. any user 104, in accordance with their subscriptions.

According to a previous solution, when the client 100 makes a one-off subscription request for presence data of a list of users 104, the client access network in turn sends a request, or "poll", for presence data to each of the networks 106a-c to which the concerned users are connected. When the client access network has received responses, or notifications, from all networks 106a-c regarding the

present states of the users 104 in the list, a notification is sent to the client containing the desired information on the users 104. This is a pure pull behaviour and can be repeated whenever the client desires to fetch such information.

However, this procedure is complicated and quite time-consuming, since the client access network must issue several requests and wait for notifications from all networks 106a-c, before sending the notification to the client. Moreover, the fetching of data will require considerable amounts of inter-network signalling, especially if many networks are involved. Upon repeated requests, some of the networks may also provide notifications comprising the same information with no updates, as compared to a previous notification. Hence, much of the inter-network signalling triggered by the client's request may even be unnecessary. In addition, when many different operators/networks are involved, standard procedures must be followed not allowing for internal and/or local optimisations.

Furthermore, in the current solution, information on all users in the list is sent to the client in response to his/her request, even if only some or none of the users have made any updates since last time. Therefore, the notification message sent to the client is always "full-sized" regardless of how many users that have actually changed their state since last time. As a result, unnecessary bandwidth for the wireless connection with the client 100 is occupied over a limited radio interface when the notification is sent to the client.

In another prior art solution, when the client 100 has an ongoing time-limited subscription for presence data

of the users 104, the client access network has in turn established a subscription with each of the concerned networks 106a-c, and thereby automatically receives a notification from any of the networks each time a user in the subscription connected thereto changes his/her presence data. Thereafter, the client access network sends a notification to the client containing the updated presence data, after each notification from the networks, according to a pure push behaviour.

10 The drawbacks of this solution is that the client may potentially receive a large amount of notifications, which will exhaust the battery power of the client terminal, and again, precious bandwidth is occupied for the client's wireless connection with the client access network 102 over a limited radio interface. Such problems can be partly overcome by the client access network setting a minimum time period between successive notifications to the same client, a so-called "rate limitation". However, if the client really needs information in real-time, the rate limitation value must be set quite short such that the actual saving of notifications becomes insignificant.

In some known solutions, the client may also be requested to set a minimum time period between successive notifications, sometimes referred to as a "throttle time".

25 Nevertheless, the client will inevitably receive user information also when not needed, or even without noticing, e.g. if the terminal is inaudible. Furthermore, in the prior solutions, the client access network must establish a separate subscription for each user that on the client has requested information for, even when several users belong to the same access domain, resulting in many inter-network messages for a single client subscription.

When providing requested information to a telecommunication client regarding a plurality of users, it is desirable to generally reduce the signalling activities, particularly over the critical radio interface, without
5 imposing unwanted delays, in the process of delivering such information to the client.

SUMMARY OF THE INVENTION

The object of the present invention is to reduce or
10 eliminate the problems outlined above. This object and others are obtained by providing a method and arrangement for providing information to a client from a client access network in the form of user information regarding a plurality of users. According to said method, a subscription
15 request is first received from the client for certain information on a set of users, whereupon information updates regarding users in the set are received and stored. A subsequent request for user information is later received from the client, and stored user information is then
20 retrieved corresponding to the requested information. Finally, a notification is sent to the client regarding the retrieved user information, in response to the subsequent user information request. Typically, the users in the set are mobile users, and the user information may be presence
25 information on the users.

If the users in the set are connected to other access networks, the client access network establishes a network subscription for user information updates with each of the other access networks to which users in the set are
30 connected, in response to the received client subscription request.

If several of the users in the set are connected to the same user access network, the client access network may send one common subscription request for those users to that user access network, including a list of the users in the set being connected to that network.

Information updates may be continuously received from the other access networks whenever changes of state are detected for the users in the set, impacting the present network subscription.

After establishing the network subscriptions, information may be initially received from the other access networks on the current states of their respective users. An initial notification may then be sent to the client regarding the received user information, before receiving the subsequent user information request.

The subsequent request for user information received from the client may be limited to a subset of users comprising fewer users than the original set of users. The subsequent user information request may further be limited to one or only some types of information, out of the information types included in the subscription. The subset of users and/or types of information of interest in the subsequent request may be selected by the client, or may be adapted to a service and/or application currently utilised by the client.

A subsequent notification may be sent to the client indicating only the changes since the previous notification, or that nothing has changed since the last notification.

The subscription request from the client may indicate the types of information needed, as well as a time of expiration. The subscription request may further indicate

a minimum time between successive notifications corresponding to the time of expiration.

The set of users may be selected by indicating a predetermined list of users, or as an ad hoc list of users.

- 5 The set of users may further be selected by adding users to or deleting users from a predetermined list of users.

The present invention further embraces an arrangement in a client access network for providing information to a connected client in the form of information
10 regarding a plurality of users. The arrangement comprises an information delivery server adapted to receive a subscription request from the client for information on a set of users, and to receive information updates regarding the set of users from their respective access networks. The
15 arrangement further comprises a data storage means for storing updated user information. The information delivery server is further adapted to receive a subsequent request for user information from the client, and to retrieve requested user information from the data storage means and
20 send a notification to the client including the retrieved user information, in response to the user information request.

If at least some of the users in the set are connected to other access networks, the information delivery
25 server may further be adapted to establish a network subscription for user information updates with each of the other access networks to which users in the set are connected, in response to the received client subscription request.

30 The information delivery server may further be adapted to continuously receive information updates from the

other access networks whenever changes of state are detected for the users in the set.

The information delivery server may further be adapted to initially receive from the other networks, information on the current states of their respective users.

The information delivery server may further be adapted to send an initial notification to the client containing the received user information.

The information delivery server may further be adapted to send to the client a subsequent notification indicating only the changes since the previous notification.

The information delivery server may further be adapted to send to the client a subsequent notification indicating that nothing has changed since the last notification.

Furthermore, the arrangement may comprise a user list server adapted to maintain various lists of users defined for clients of the client access, and to provide a predetermined list as a basis for the selected set users.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in more detail by means of preferred embodiments and with reference to the accompanying drawings, in which:

- Fig. 1 is a schematic view of a typical communication scenario for providing information on users to a client, according to the prior art.
- Fig. 2 is a schematic view of a communication scenario for providing information on users to a client, in accordance with one embodiment of the present solution.

- Fig. 3 is a flow chart illustrating a procedure for updating user information, which is known per se but can be utilised for the present solution.
- Fig. 4 is a flow chart illustrating a procedure for providing user information to a client, according to one embodiment of the present solution.

DESCRIPTION OF PREFERRED EMBODIMENTS

A preferred embodiment of the present invention will now be described, initially with reference to Fig. 2. Similar to the communication scenario illustrated in Fig. 1, a client 200 is connected to a client access network 202 using a terminal capable of wireless communication. In this context, the term "client access network" should be broadly understood as any network capable of providing the below-described service to the client being currently connected thereto, and is not necessarily the network where the client has his/her permanent mobile subscription, i.e. the home network. The client access network 202 could also be a visited network, e.g. in a foreign country.

Also, a number of other mobile users 204 are connected to various further mobile access networks 206 in other domains. In this example, three such networks 206a-c are shown, although any number of networks and users may be involved in the present invention, typically many more than those illustrated here. A number of further mobile users 204, not shown, may also be connected to the client access network 202 which can be involved in the service described below, although not included here. It should be noted that the present invention is not limited to mobile users, but can be used for fixed users as well, or a mix of mobile and fixed users.

Each of the networks 202, 206 is adapted to generally provide updated user information to subscribing clients as requested, e.g. according to the above-described presence service by having an IMS network connected to each network. In this example, each of the networks 206a, 206b and 206c comprises a user data collecting unit 208a, 208b and 208c, respectively. Each unit 208a-c is adapted to detect changes of state for users, e.g. by receiving event publications, either from connected users 204 or by receiving information from the associated network itself, whenever a user changes his/her state, e.g. the presence data as exemplified above, in some predefined manner. The user data collecting units 208a-c are thus adapted to keep track on the states of the users 204, based on the received information. A corresponding user data collecting unit may of course be arranged in the client network 202 to collect user information from its connected users, although not specifically indicated in the figure.

For example, a network 206 may have a functionality of detecting the geographic position of a user, e.g. by means of GPS (Global Positioning System), or signal strength and/or signal delay measurements, which is stored in the associated user data collecting unit 208. Whenever the network detects a change in the user's position, the user data collecting unit will update the current position data for the user. In another example, a user may input a current personal mood in his/her terminal, such as "sad" or "happy", which is sent to the network and its user data collecting unit for update, and so forth.

The client access network 202 comprises an information delivery server 210 for providing information to the client 200 regarding a plurality of users, as desired by

the client, by sending notifications to the client, to be described below. Of course, a corresponding information delivery server may be arranged in each of the networks 206, although not shown here. For example, the information
5 delivery server may be integrated with a user data collecting unit in a single server or entity. In practice, the server 210 may be a Resource List Server (RLS) if an IMS network is implemented in the client access network 202, although the general term "information delivery server" will
10 be used in this description to represent any possible network entity having the function described below. The user information in question may of course include any of the above-described types of presence data or similar, but is not limited thereto.

15 The server 210 is connected to a user list server 212, which in the IMS example is an entity called "Group List Management Server, GLMS". The user list server 212 is adapted to maintain various lists of users defined for clients of the client access network 202, such as phone
20 books, contact groups or the like. The lists may further be divided into various sublists, e.g. depending on specific subjects and interests. The sublists may further be valid for specific services and/or applications. The user list server 212 is also connected to a user data storage means
25 214, hereafter called user database, for storing updated user information according to the lists, to be described below. The user database 214 may be implemented as a cache memory or the like. In practice, the above-described functional units 210, 212 and 214 may be incorporated into
30 one common server unit.

Briefly described, the present solution allows the client to initially subscribe for selected state information

on a set of users as defined by a user list, either predefined or ad hoc, during a limited and specified period of time. In response to such a subscription request from the client, the information delivery server 210 then establishes
5 a subscription for user information with each network 206a-c to which the users in the set are connected. The associated user data collecting units 208a-c will then send updated user information to the information delivery server 210, whenever a user change his/her state or presence data in a
10 way that impacts the user information of interest as selected by the client for the subscription.

In the present solution, however, the information delivery server 210 does not automatically send notifications to the client as soon as changes occur. In
15 contrast to the previously used push behaviour, the updates received from the other networks are stored in the user database 214 for later retrieval, instead of being pushed to the client. Thus, received updated information is continuously collected in the user database 214 for the
20 duration of the subscription.

When the client 200 really wants user information, he/she can send a subsequent data request to the information delivery server 210. In response to such a data request, relevant and updated data is retrieved from the user
25 database according to the list as maintained in the user list server 212, and the data is then duly sent to the client 200. In this way, notifications will only be sent to the client when really needed and asked for, and the relevant information has already been collected in the
30 database 214, ready to be promptly sent to the client upon request. Hence, the present solution is a combination of a push behaviour of the networks 206 to the client access

network 202, and a pull behaviour of the client 200 from the client access network 202.

Fig. 3 illustrates a flow chart of a procedure for updating user information during a subscription. As mentioned above, the information delivery server 210 establishes a network subscription with each network 206a-c to which the users in the set are connected, in response to receiving an initial subscription request from a client 200. The subscription request from the client may contain a specification of the particular users on which the client is interested to receive information, and also of what type of information the client wants to receive. The client may also indicate the duration of the subscription, e.g. specified as an expiry time. Alternatively, the subscription may be set to run for the time being, i.e. until the client indicates that is to be terminated, or may be limited by a default duration length if the client has not indicated a duration.

The client may indicate the set of users of interest by giving a mere reference to a predetermined list which is already known in the user list server 212. Alternatively, the users may be individually specified in an ad hoc list given by the client, or users may be added to and/or deleted from a predetermined list.

The flow chart in Fig. 3 illustrates the procedure executed in a user data collecting unit 208 associated with one of the networks 206 to which one or more users in the set is/are connected. The client access network 202 first sends a network subscription request for information on one or more specific users belonging to the network 208 in question, in accordance with the client's request. Thus in a first step 300, a subscription request is received from the client access network 202 with the same expiry time as that

specified by the client. From now on, the user data collecting unit 208 will send notifications to the client access network regarding the concerned user(s) whenever changes occur impacting the requested user information.

5 Next in a step 302, a change of state is detected for a user in the set, e.g. in a manner as described above, indicating that this particular user has changed his/her state, e.g. presence data, in some way that is relevant to the subscription. A notification is then sent from that
10 user's access network to the client access network, containing updated user information indicating the detected change of the user, in a next step 304.

 In this example, a step 306 is illustrated where it is determined whether the subscription with the client
15 access network has expired. If not, steps 302 and 304 may be repeated whenever a user changes his/her state or presence data as relevant to the subscription. When the network subscription has finally expired, it is terminated in a step 308 and no more updates are sent to the client access
20 network. Of course, an active step 306 of checking the expiration may not be necessary, as the subscription can be automatically terminated as soon the time has expired, or when the client indicates termination.

 It should be noted that the updating procedure
25 described in Fig. 3 is basically the same as previously used for a pure push behaviour, and is therefore not affected by the present solution. The inventive procedure of providing information to a client, as described below with reference to a preferred embodiment illustrated in Fig. 4, however
30 utilises a pull mechanism between the client and the client access network. The following procedure is generally executed in the client access network 202, the active steps

being mostly taken by the information delivery server 210 illustrated in Fig. 2.

In a first step 400, the client access network 202 receives a subscription request from the client 200 indicating a set of users 204, as described above, such that the client access network can identify the users, the wanted type(s) of user information and the duration of the client's requested subscription, e.g. by means of predetermined lists maintained by the user list server 212. The subscription duration may be determined in different ways, as exemplified in connection with Fig. 3.

From this information, the client access network can send corresponding subscription requests to the concerned networks 206 to which the users 204 are connected, and a network subscription is established accordingly with each network 206a-c, in a step 402, for information on users in the set connected to the networks, respectively. The network subscriptions may also be limited to specific types of information, as requested by the client, such as position only, or position and mood, etc. It should be noted that the user set of interest may well include users that are connected to the client access network as well.

In one embodiment, in the case when several of the users in the set are connected to the same network 206, the client access network preferably sends one common subscription request for information on those users to that network 206, including a list of the users in the set being connected to that network. This will result in a reduced amount of signalling as compared to sending a separate subscription request for each user to the same network 206. Hence, only one subscription request is preferably sent per domain in order to minimise the inter-network signalling.

Another benefit is that any throttling or rate-limiting functions for the subscription can be controlled per domain, instead of per user.

Once a subscription has been established with each
5 network 206, the networks will initially send information on the current states of their respective users 204, which is received in a step 404. Next, the client access network 202 may send an initial notification to the client 200 containing the current states of the users of interest,
10 according to the received information, in a step 406, assuming that the client is interested in the information immediately after having sent the subscription request. In this concept, and in the following, the term "notification" is intended to cover any type and/or combination of
15 message(s) and/or indication(s) that can be utilised to convey this kind of information to the client.

In an alternative embodiment, step 406 may however be omitted in order to avoid any unneeded notification not requested by the client. So far, a push behaviour has been
20 used but from now on, after the initial data has been sent to the client, the client access network will not send any data unless the client asks for it, hence a pull behaviour.

According to the ongoing network subscriptions, the client access network receives from the networks 206 various
25 updates on the user information relevant to the subscription, whenever the users change their states, as described in connection with Fig. 3, which is generally indicated in a next step 408. Each time such updated information is received, the client access network stores it
30 in the user database 214, as indicated in a step 410. If users connected to the client access network are also

included in the list, relevant updates on them can of course be handled internally by the client access network.

Next, a step 412 is illustrated for checking whether the client's subscription has expired or not, and if it has, the client subscription, as well as the associated network subscriptions having the same expiration time, are terminated in a step 414. However in practice, it is not necessary to perform this as a specific step at this point in the procedure, but this can of course be checked or watched more or less continuously throughout the procedure.

Next in the procedure, the client has decided to fetch updated information, and a subsequent information request is received from the client in a step 416. Typically, a certain amount of time has elapsed since the user information was initially sent in step 406, and some of the user information may have changed during this period.

In one embodiment, the subsequent information request received from the client may be limited to a subset of users comprising fewer users than the original set of users in the client's subscription. Furthermore, the subsequent information request may be limited to only one or some of the different types of information included in the subscription. For example, the requested subset of users and/or information type(s) may be adapted to a service and/or application currently utilised by the client. In this way, the client is free to request updated information for any selected users in the original set, or for any selected type(s) of user information of the subscription, depending on his/her current needs.

In response to the client's information request, the current updated version of the requested user information is retrieved from the user database 214, in a

next step 418, which is then duly sent to the client in a notification, in a step 420. Retrieving relevant data from the user database in this way is a much faster procedure as compared to requesting and receiving the information from all of the concerned networks 206.

The process may then move back to step 408 for receiving further updates from the networks 206, as in step 408, as well as any further subsequent information requests made by the client, as in step 416. In order to make the notifications to the client shorter and more efficient, a short indication of only the information changes since the last notification is preferably sent in the notification step 420, instead of the complete set of data. If nothing has changed since the last notification, a very short indication thereof may be sent. In this way, the size of the notification message(s) sent to the client may be less than full-sized and can be kept at a minimum, resulting in optimal use of precious bandwidth in the wireless interface.

By the combined push and pull mechanisms according to the present invention, a most efficient solution is obtained where a minimum of data amounts need to be transmitted between the client access network 202 and the other access networks 206, as well as between the client access network 202 and the client 200. In particular, the client access network does not have to fetch information from every network when information is requested by the client, but this information has already been received and stored continuously by means of the ongoing network subscriptions and is therefore immediately available from the user database.

Wanted information can also be conveyed to the client with a minimum of delays, i.e. the need for real-time

information can be satisfied to a great extent. Moreover, this solution offers great flexibility for the client, since user information may be requested for any of the users in the originally subscribed set of users, depending on the client's current needs or on which service and/or application is utilised at the moment.

The above-described service can be accomplished by using existing messages and protocols, e.g. as currently being defined by the IETF specification RFC3265. In order not to receive unwanted notifications from the client access network, the client can then indicate a throttle time equal to the expiration time, such that no notifications will be issued, or pushed, automatically during the entire subscription, other than when occasionally requested, or pulled, by the client.

The present invention may be used in conjunction with existing services available from the IMS network, such as "Push-to-Talk over Cellular" (PoC), Instant Messaging and of course the above-described Presence service, etc.

While the invention has been described with reference to specific exemplary embodiments, the description is only intended to illustrate the inventive concept and should not be taken as limiting the scope of the invention, which is defined by the appended claims.

CLAIMS

1. A method of providing information to a client from a client access network in the form of user information regarding a plurality of users, **characterised by** the following steps:
- receiving a subscription request from the client for certain information on a set of users,
 - receiving and storing information updates regarding users in the set,
 - receiving a subsequent request for user information from the client,
 - retrieving stored user information corresponding to the requested information, and
 - sending a notification to the client regarding the retrieved user information, in response to the subsequent user information request.
2. A method according to claim 1, **characterised in** that the users are mobile users.
3. A method according to claim 1 or 2, **characterised in** that the user information is presence information on the users.
4. A method according to any of claims 1-3, wherein at least some of the users in the set are connected to other access networks, **characterised in** that the client access network establishes a network subscription for user information updates with each of the other access networks to which users in the set are connected, in response to the received client subscription request.

5. A method according to claim 4, wherein several of the users in the set are connected to the same user access network, **characterised in** that the client access network sends one common subscription request for those users to that user access network, including a list of the users in the set being connected to that network.
6. A method according to claim 4 or 5, **characterised in** that information updates are continuously received from the other access networks whenever changes of state are detected for the users in the set, impacting the present network subscription.
7. A method according to any of claims 4-6, **characterised in** that, after establishing the network subscriptions, information is initially received from the other access networks on the current states of their respective users.
8. A method according to claim 7, **characterised in** that an initial notification is sent to the client regarding the received user information, before receiving the subsequent user information request.
9. A method according to any of claims 1-8, **characterised in** that the subsequent request for user information received from the client is limited to a subset of users comprising fewer users than the original set of users.
10. A method according to any of claims 1-9, **characterised in** that the subsequent request for user information received from the client is limited to one or some types of

information of the information included in the
subscription.

11.A method according to claim 9 or 10, **characterised in**
5 that the subset of users and/or types of information is
selected by the client.

12.A method according to claim 9 or 10, **characterised in**
that the subset of users and/or types of information is
10 adapted to a service and/or application currently
utilised by the client.

13.A method according to any of claims 1-12, **characterised**
in that a subsequent notification is sent to the client
15 indicating only the changes since the previous
notification.

14.A method according to any of claims 1-12, **characterised**
in that a subsequent notification is sent to the client
20 indicating that nothing has changed since the last
notification.

15.A method according to any of claims 1-14, **characterised**
in that the subscription request from the client
25 indicates the types of information needed.

16.A method according to any of claims 1-15, **characterised**
in that the subscription request from the client
indicates a time of expiration.

17.A method according to claim 16, **characterised in** that the
subscription request from the client specifies a minimum

time between successive notifications corresponding to the time of expiration.

18.A method according to any of claims 1-17, **characterised**
5 **in** that the set of users is selected by indicating a predetermined list of users.

19.A method according to any of claims 1-17, **characterised**
10 **in** that the set of users is selected as an ad hoc list of users.

20.A method according to any of claims 1-17, **characterised**
15 **in** that the set of users is selected by adding users to or deleting users from a predetermined list of users.

21.An arrangement in a client access network for providing information to a connected client in the form of information regarding a plurality of users, **characterised by:**

20 - an information delivery server adapted to receive a subscription request from the client for certain information on a set of users, and to receive information updates regarding the set of users from their respective access networks,

25 - a data storage means for storing updated user information,

wherein the information delivery server is further adapted to receive a subsequent request for user information from the client, and to retrieve requested user information from the data storage means and send a notification to the client including the retrieved user information, in response to the user information request.

22. An arrangement according to claim 21, wherein at least some of the users in the set are connected to other access networks, **characterised in** that the information delivery server is further adapted to establish a network subscription for user information updates with each of the other access networks to which users in the set are connected, in response to the received client subscription request.
23. An arrangement according to claim 21 or 22, **characterised in** that the information delivery server is further adapted to continuously receive information updates from the other access networks whenever changes of state are detected for the users in the set.
24. An arrangement according to any of claims 21-23, **characterised in** that the information delivery server is further adapted to initially receive from the other networks information on the current states of their respective users.
25. An arrangement according to claim 24, **characterised in** that the information delivery server is further adapted to send an initial notification to the client containing the received user information.
26. An arrangement according to any of claims 21-25, **characterised in** that the information delivery server is further adapted to send to the client a subsequent notification indicating only the changes since the previous notification.

27. An arrangement according to any of claims 21-25,
characterised in that the information delivery server is
further adapted to send to the client a subsequent
5 notification indicating that nothing has changed since
the last notification.

28. An arrangement according to any of claims 21-27, further
comprising a user list server adapted to maintain various
10 lists of users defined for clients of the client access
network, characterised in that the user list server is
adapted to provide a predetermined list as a basis for
the selected set users.

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204
2

ABSTRACT

A method and arrangement for providing information to a client (200) from a client access network (202) regarding a requested set of users (204), at least some of which are connected to other access networks (206). In response to a client subscription request, the client access network establishes a network subscription with the other access networks. Information updates regarding users in the set are then continuously received and stored in a database (214) of the client access network, whenever the users change their state. In response to a subsequent request for user information from the client, corresponding stored user information is retrieved from the database and sent in a notification to the client.

15

(Fig. 2)

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

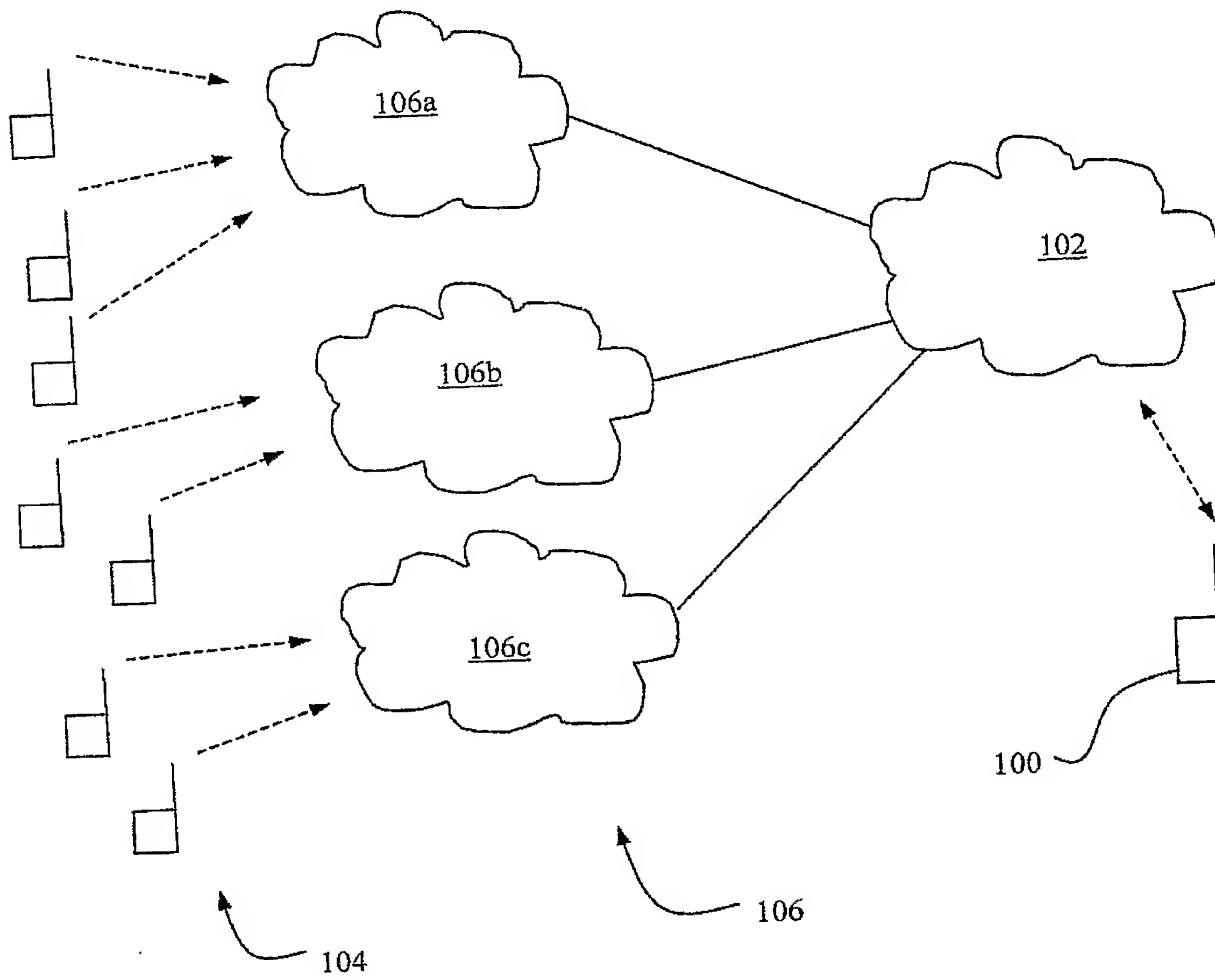


Fig. 1

2/3

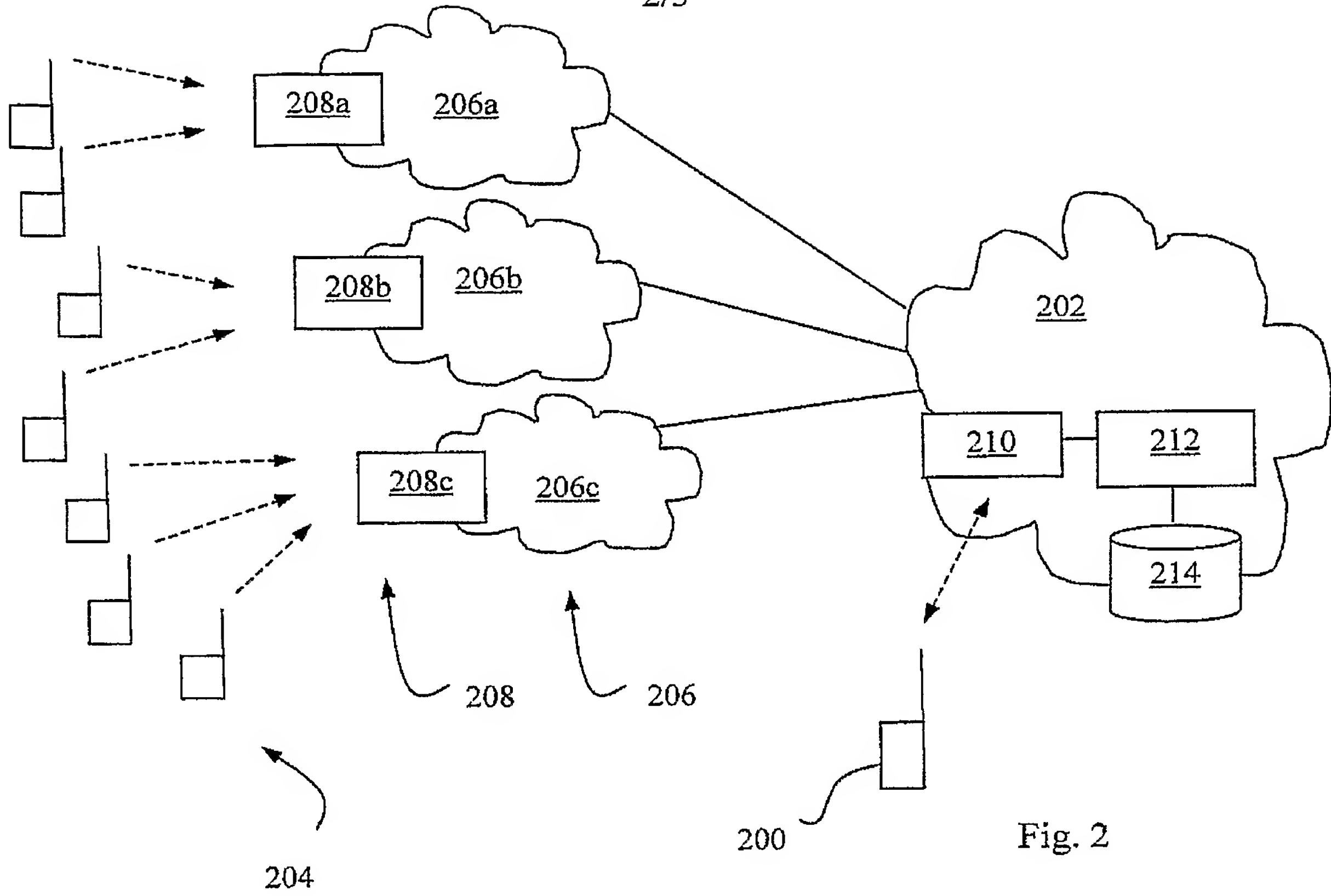


Fig. 2

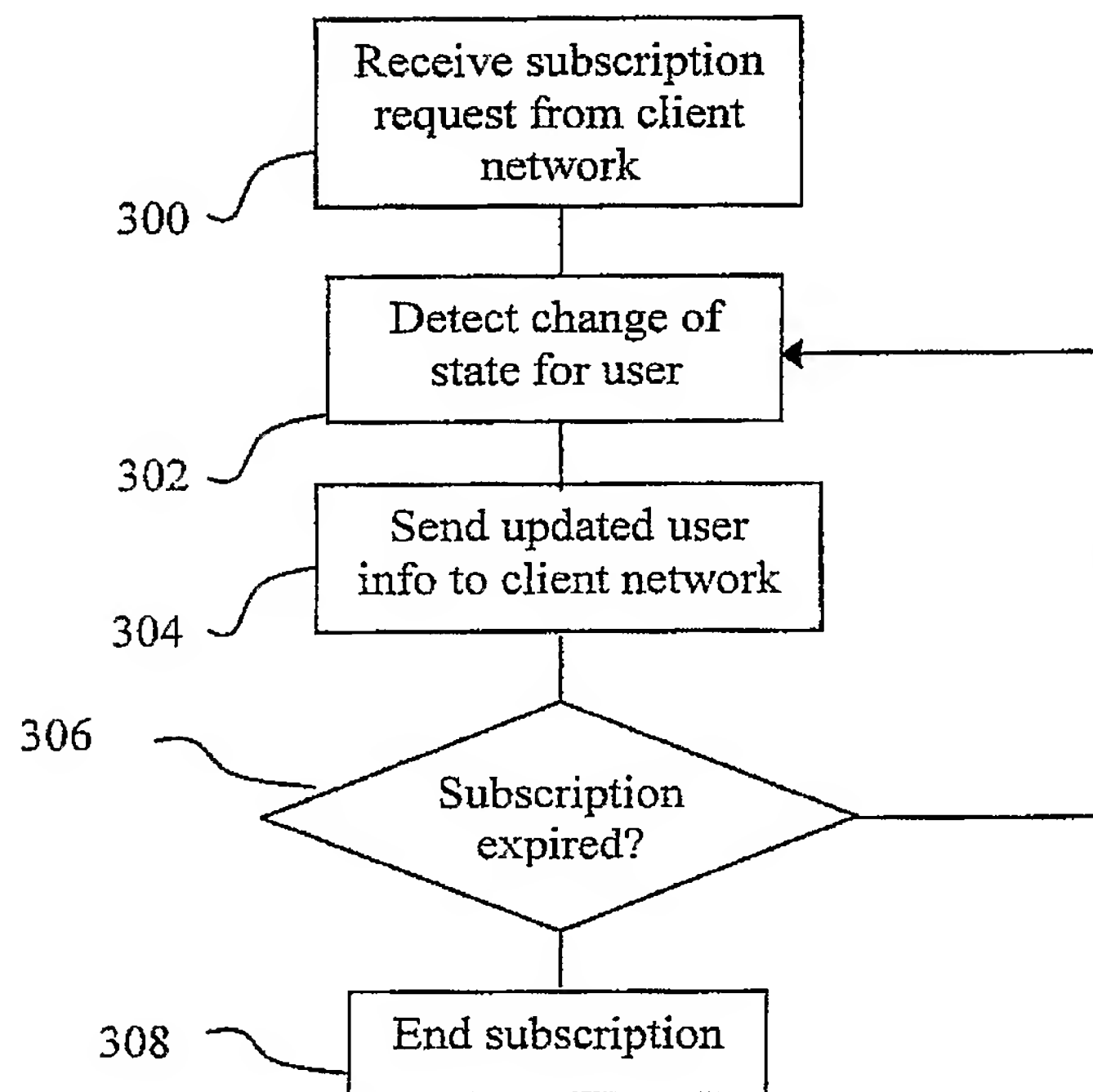


Fig. 3

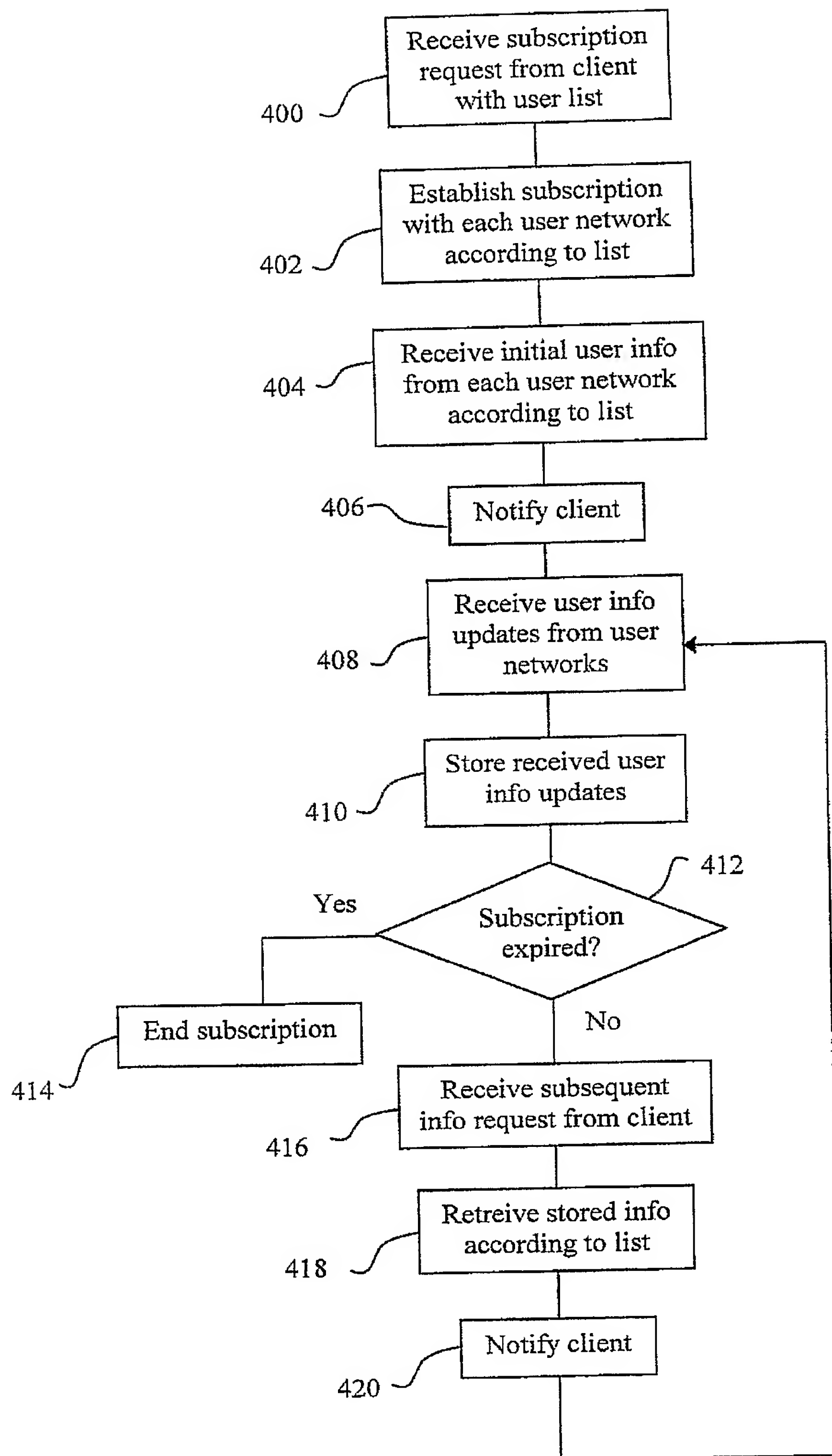


Fig. 4